

CLAIMS

1. An isolated polynucleotide comprising:
 - a) a first nucleotide sequence that encodes a protein that exhibits interferon alpha-type activity, and that hybridizes under stringent hybridization conditions to all or part of SEQ ID NO. 1, provided that the first nucleotide sequence has a guanine at nucleotide position 516 or the equivalent position;
or
 - b) a complementary nucleotide sequence that is strictly complementary to the first nucleotide sequence.
2. The isolated polynucleotide of claim 1, wherein the first nucleotide sequence comprises the cDNA or mRNA of SEQ ID NO. 1.
3. The isolated polynucleotide of claim 1, wherein the first nucleotide sequence has an identity of at least 80% with all or part of SEQ ID NO. 1.
4. The isolated polynucleotide of claim 3, wherein the first nucleotide sequence has an identity of at least 90% with all or part of SEQ ID NO. 1 and encodes a protein that exhibits interferon alpha-5-type activity.
5. The isolated polynucleotide of claim 4, wherein the first nucleotide sequence has an identity of at least 95% with all or part of SEQ ID NO. 1.
6. The isolated polynucleotide of claim 5, wherein the first nucleotide sequence has an identity of at least 99% with all or part of SEQ ID NO. 1 and encodes a protein that exhibits human interferon alpha-5 type activity.
7. The isolated polynucleotide of claim 3, wherein the presence of a guanine nucleotide

at position 516 or the equivalent position is due to an a516g SNP or the same SNP at an equivalent position.

8. An isolated polynucleotide comprising:
 - a) a first nucleotide sequence that encodes a protein that exhibits human interferon alpha-5 type activity, and that comprises all or part of SEQ ID NO. 1, provided that the first nucleotide sequence has a guanine at nucleotide position 516 or the equivalent position; or
 - b) a complementary nucleotide sequence that is strictly complementary to the first nucleotide sequence.
9. An isolated polynucleotide comprising:
 - a) a first nucleotide sequence that encodes a protein that exhibits interferon alpha-type activity, and that hybridizes under stringent hybridization conditions to all or part of SEQ ID NO. 1, provided that the first nucleotide sequence has a guanine at nucleotide position 641 or the equivalent position; or
 - b) a complementary nucleotide sequence that is strictly complementary to the first nucleotide sequence.
10. The isolated polynucleotide of claim 9, wherein the first nucleotide sequence comprises the cDNA or mRNA of SEQ ID NO. 1.
11. The isolated polynucleotide of claim 9, wherein the first nucleotide sequence has an identity of at least 80% with all or part of SEQ ID NO. 1.
12. The isolated polynucleotide of claim 11, wherein the first nucleotide sequence has an identity of at least 90% with all or part of SEQ ID NO. 1 and encodes a protein

that exhibits interferon alpha-5-type activity.

13. The isolated polynucleotide of claim 12, wherein the first nucleotide sequence has an identity of at least 95% with all or part of SEQ ID NO. 1.
14. The isolated polynucleotide of claim 13, wherein the first nucleotide sequence has an identity of at least 99% with all or part of SEQ ID NO. 1 and encodes a protein that exhibits human interferon alpha-5-type activity.
15. The isolated polynucleotide of claim 11, wherein the presence of a guanine nucleotide at position 641 or the equivalent position is due to a c641g SNP or the same SNP at an equivalent position.
16. An isolated polynucleotide comprising:
 - a) a first nucleotide sequence that encodes a protein that exhibits human interferon alpha-5-type activity, and that comprises all or part of SEQ ID NO. 1, provided that the first nucleotide sequence has a guanine at nucleotide position 641 or the equivalent position; or
 - b) a complementary nucleotide sequence that is strictly complementary to the first nucleotide sequence.
17. An isolated polynucleotide comprising:
 - a) a first nucleotide sequence that encodes a protein that exhibits interferon alpha-type activity, and that hybridizes under stringent hybridization conditions to all or part of SEQ ID NO. 1, provided that the first nucleotide sequence has a cytosine at nucleotide position 798 or the equivalent position; or
 - b) a complementary nucleotide sequence that is strictly complementary to the

first nucleotide sequence.

18. The isolated polynucleotide of claim 17, wherein the first nucleotide sequence comprises the cDNA or mRNA of SEQ ID NO. 1.
19. The isolated polynucleotide of claim 17, wherein the first nucleotide sequence has an identity of at least 80% with all or part of SEQ ID NO. 1.
20. The isolated polynucleotide of claim 19, wherein the first nucleotide sequence has an identity of at least 90% with all or part of SEQ ID NO. 1 and encodes a protein that exhibits interferon alpha-5-type activity.
21. The isolated polynucleotide of claim 20, wherein the first nucleotide sequence has an identity of at least 95% with all or part of SEQ ID NO. 1.
22. The isolated polynucleotide of claim 21, wherein the first nucleotide sequence has an identity of at least 99% with all or part of SEQ ID NO. 1 and encodes a protein that exhibits human interferon alpha-5-type activity.
23. The isolated polynucleotide of claim 19, wherein the presence of a cytosine nucleotide at position 798 or the equivalent position is due to a g798c SNP or the same SNP at an equivalent position.
24. An isolated polynucleotide comprising:
 - a) a first nucleotide sequence that encodes a protein that exhibits human interferon alpha-5-type activity, and that comprises all or part of SEQ ID NO. 1, provided that the first nucleotide sequence has a cytosine at nucleotide position 798 or the equivalent position; or
 - b) a complementary nucleotide sequence that is strictly complementary to the

first nucleotide sequence.

25. An isolated polynucleotide comprising:
- a) a first nucleotide sequence that encodes a protein that exhibits interferon alpha-type activity, and that hybridizes under stringent hybridization conditions to all or part of SEQ ID NO. 1, provided that the first nucleotide sequence comprises one or more of a c42t, g43a, c82t, a123t, g152c, t174c, g292c, or g1009a SNP(s), or the same SNP(s) at an equivalent position(s) ;
or
 - b) a complementary nucleotide sequence that is strictly complementary to the first nucleotide sequence.
26. The isolated polynucleotide of claim 25, wherein the first nucleotide sequence comprises two or more of said SNPs.
27. The isolated polynucleotide of claim 25, wherein the first nucleotide sequence has an identity of at least 80% with all or part of SEQ ID NO. 1.
28. The isolated polynucleotide of claim 27, wherein the first nucleotide sequence has an identity of at least 90% with all or part of SEQ ID NO. 1 and encodes a protein that exhibits interferon alpha-5-type activity.
29. The isolated polynucleotide of claim 28, wherein the first nucleotide sequence has an identity of at least 95% with all or part of SEQ ID NO. 1.
30. The isolated polynucleotide of claim 29, wherein the first nucleotide sequence has an identity of at least 99% with all or part of SEQ ID NO. 1 and encodes a protein that exhibits human interferon alpha-5-type activity.

31. An isolated polynucleotide comprising:
- a) a first nucleotide sequence that encodes a protein that exhibits human interferon-alpha-type activity, and that comprises all or part of SEQ ID NO. 1, provided that the first nucleotide sequence comprises one or more of a c42t, g43a, c82t, a123t, g152c, t174c, g292c, or g1009a SNP(s), or the same SNP(s) at an equivalent position(s); or
 - b) a complementary nucleotide sequence that is strictly complementary to the first nucleotide sequence.
32. An isolated polynucleotide that encodes a polypeptide comprising all or part of SEQ ID NO. 2, provided that the polypeptide exhibits interferon alpha-5 type activity and comprises a Q28R SNP or the same SNP at an equivalent position.
33. An isolated polynucleotide that encodes a polypeptide comprising all or part of SEQ ID NO. 2, provided that the polypeptide exhibits interferon alpha-5 type activity and comprises a Q70E SNP or the same SNP at an equivalent position.
34. An isolated polynucleotide that encodes a polypeptide comprising all or part of SEQ ID NO. 2, provided that the polypeptide exhibits interferon alpha-5 type activity and comprises a C122S SNP or the same SNP at an equivalent position.
35. A host cell comprising a recombinant vector comprising the isolated polynucleotide of claim 1, 9, 17, 25, 32, 33, or 34.
36. A method for detecting or genotyping a first nucleic acid sequence having an identity of at least 90% with all or part of SEQ ID NO. 1 or its coding region, or the strict complement thereof, comprising: hybridizing to the first nucleic acid sequence a second nucleic acid sequence that has an identity of at least 90% with all or part of SEQ ID NO. 1, or the strict complement thereof, provided that the second nucleic

acid sequence comprises one or more of a c42t, g43a, c82t, a123t, g152c, t174c, g292c, a516g, c641g, g798c, or g1009a SNP(s), or the same SNP(s) at an equivalent position(s), or the complement(s) of said SNP(s).

37. A method for determining statistically relevant associations between a disease or disease resistance and one or more of a c42t, g43a, c82t, a123t, g152c, t174c, g292c, a516g, c641g, g798c, or g1009a SNP(s), or the same SNP(s) at an equivalent position(s), comprising:
 - a) genotyping a sample of individuals with respect to said SNP(s);
 - b) determining the distribution of said disease or resistance within the sample;
 - c) comparing the genotype data with the distribution of said disease or resistance; and
 - d) analyzing the comparison for statistically relevant associations.
38. A method for diagnosing a disease, or determining a prognosis of or resistance to the disease, in an individual, comprising: determining whether an interferon alpha-5 gene of the individual comprises one or more of a c42t, g43a, c82t, a123t, g152c, t174c, g292c, a516g, c641g, g798c, or g1009a SNP(s), or the same SNP(s) at an equivalent position(s).
39. An isolated polypeptide comprising a peptide sequence having an identity of at least 90% identity with:
 - a) the amino acid sequence of SEQ ID NO. 2, or
 - b) the amino acid sequence of amino acids 24 through 189 of SEQ ID NO. 2,provided that the peptide sequence comprises the Q28R SNP or the same SNP at an equivalent position.

40. The isolated polypeptide of claim 39, wherein the peptide sequence has an identity of at least 95% with the amino acid sequence of a) or b).
41. The isolated polypeptide of claim 40, wherein the peptide sequence has an identity of at least 99% with the amino acid sequence of a) or b).
42. An isolated polypeptide comprising a peptide sequence having an identity of at least 90% identity with:
 - a) the amino acid sequence of SEQ ID NO. 2, or
 - b) the amino acid sequence of amino acids 24 through 189 of SEQ ID NO. 2, provided that the peptide sequence comprises the Q70E SNP or the same SNP at an equivalent position.
43. The isolated polypeptide of claim 42, wherein the peptide sequence has an identity of at least 95% with the amino acid sequence of a) or b).
44. The isolated polypeptide of claim 43, wherein the peptide sequence has an identity of at least 99% with the amino acid sequence of a) or b).
45. An isolated polypeptide comprising a peptide sequence having an identity of at least 90% identity with:
 - a) the amino acid sequence of SEQ ID NO. 2, or
 - b) the amino acid sequence of amino acids 24 through 189 of SEQ ID NO. 2, provided that the peptide sequence comprises the C122S SNP or the same SNP at an equivalent position.
46. The isolated polypeptide of claim 45, wherein the peptide sequence has an identity of at least 95% with the amino acid sequence of a) or b).

47. The isolated polypeptide of claim 46, wherein the peptide sequence has an identity of at least 99% with the amino acid sequence of a) or b).
48. An antibody immunospecific for the isolated polypeptide of claim 39, 42, or 45.
49. A method for treating or preventing a disease or disorder linked to interferon alpha-5, comprising administering to an individual a therapeutically effective amount of a therapeutic agent comprising the isolated polypeptide of claim 39, 42, or 45 with a pharmaceutically acceptable excipient.
50. A method for preventing or treating cancers, tumors, or immunological diseases, comprising administering to an individual a therapeutically effective amount of a therapeutic agent comprising the isolated polypeptide of claim 39, 42, or 45 with a pharmaceutically acceptable excipient.
51. A method for identifying a compound with an activity substantially similar to an activity of an interferon alpha-5 protein that comprises one or more of a Q28R, Q70E, or C122S SNP(s), or the same SNP(s) at an equivalent position(s), comprising:
 - a) determining whether or the extent to which said compound exhibits an activity selected from the group consisting of dendritic cell maturation, cytokine release by CD4+ or CD8+ T-lymphocytes, cytokine release by monocytes, *in vitro* or *in vivo* antiviral activity, cellular antiproliferative activity on Daudi Burkitt's cell lines, cellular antiproliferative activity on TF-1 cell lines, *in vitro* or *in vivo* antiviral activity, and any combination of the foregoing activities; and
 - b) comparing the activity determined in step a) with the activity of said interferon alpha-5 protein.

52. The method of claim 51, wherein said interferon alpha-5 protein comprises at least the C122S SNP.

53. A therapeutic agent comprising one or more compounds selected from the group consisting of:

- a) an isolated polynucleotide comprising: (i) a first nucleotide sequence that has an identity of at least 99% with all or part of SEQ ID NO. 1 or the coding region thereof, provided that the first nucleotide sequence has a guanine at nucleotide position 516 or the equivalent position thereto, and/or a guanine at nucleotide position 641 or the equivalent position thereto, and/or a cytosine at nucleotide position 798 or the equivalent position thereto, and encodes a protein that exhibits interferon alpha-5-type activity, or (ii) a complementary nucleotide sequence that is strictly complementary to the first nucleotide sequence;
- b) a recombinant vector comprising said isolated polynucleotide or the cDNA or mRNA thereof;
- c) a host cell comprising said recombinant vector;
- d) an isolated polypeptide comprising (i) a peptide sequence that has an identity of at least 99% with SEQ ID NO. 2, provided that said polypeptide comprises a Q28R, Q70E, C122S or the same SNP(s) at the equivalent position(s), or (ii) a portion of said polypeptide comprising said SNP(s) provided that the portion of the polypeptide exhibits substantially the same biological activity as the mature or immature form of the polypeptide; or
- e) any combination of the compositions of a), b), c), or d).

54. A method for genotyping a nucleic acid potentially comprising an a516g SNP or the same SNP at the equivalent position, comprising:

- a) hybridizing an oligonucleotide to a portion of the nucleic acid that is adjacent to nucleotide residue position 516 or the equivalent position;
 - b) elongating the oligonucleotide in a solution comprising a labeled dideoxynucleotide complementary to guanine; and
 - c) detecting in the elongated oligonucleotide the presence or absence of the labeled dideoxynucleotide at position 516 or the equivalent position.
55. A method for genotyping a nucleic acid potentially comprising a c641g SNP or the same SNP at the equivalent position, comprising:
- a) hybridizing an oligonucleotide to a portion of the nucleic acid that is adjacent to nucleotide residue position 641 or the equivalent position;
 - b) elongating the oligonucleotide in a solution comprising a labeled dideoxynucleotide complementary to guanine; and
 - c) detecting in the elongated oligonucleotide the presence or absence of the labeled dideoxynucleotide at position 641 or the equivalent position.
56. A method for genotyping a nucleic acid potentially comprising a g798c SNP or the same SNP at the equivalent position, comprising:
- a) hybridizing an oligonucleotide to a portion of the nucleic acid that is adjacent to nucleotide residue position 798 or the equivalent position;
 - b) elongating the oligonucleotide in a solution comprising a labeled dideoxynucleotide complementary to cytosine; and
 - c) detecting in the elongated oligonucleotide the presence or absence of the labeled dideoxynucleotide at position 798 or the equivalent position.